

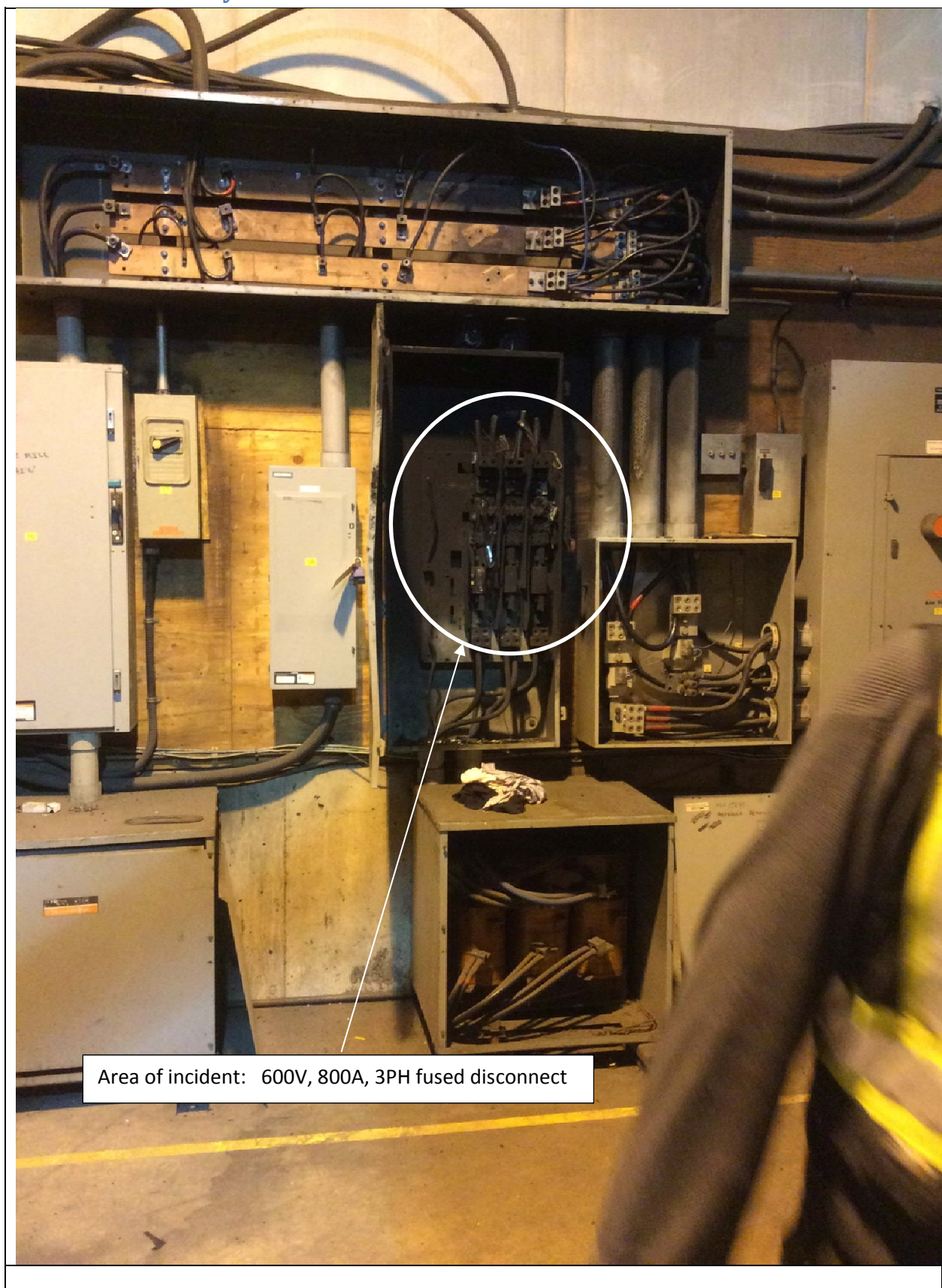
Incident Summary – POSSE #5616585

SUPPORTING INFORMATION	Incident Date			May 02, 2017			
	Location			Trail, BC			
	Regulated industry sector			Electrical – low voltage electrical system (30 to 750 volt)			
	Impact	Injury	Qty injuries	0			
			Injury description	N/A			
			Injury rating	None			
		Damage	Damage description	A 600 volt, 800 amp phase fused equipment disconnect suffered extensive internal damage from a component failure and arcing flashover to the disconnect enclosure. The flashover resulted in an electrical fire inside the disconnect of the conductor insulations and plastic components. The heat from the electrical fire damaged adjacent plastic raceways and conductors installed within a one meter radius of the incident.			
			Damage rating	Moderate			
Incident rating			Moderate				
Incident overview			One of the three blade type moving contacts of a 3 phase, 600 volt, 800 amp fused disconnect had not been making an effective contact when closed. Over time, the faulty connection created a high impedance arcing fault resulting in an overheating condition at the contact point, an eventual breakdown of the contact insulating properties and a short circuit fault to the disconnect enclosure which is bonded to ground. The ground fault created an arc flash which in turn opened the fuses, ignited the supply conductor insulation and internal plastics and created a fire incident.				
INVESTIGATION CONCLUSIONS	Site, system and components			A fused disconnect is designed to open and close moving contacts via an operating handle. The operating handle is coupled to the moving blades of the contacts and the contacts are forced open and closed by the movement of the handle; the force and speed of the moving blades are increased and assisted with spring tension. It is vital that the blades open or close as quickly as possible and with designed dynamic forces from springs to assure a positive and complete contact and to reduce the magnitude and time of electric arcs when the disconnect is operated energized with a connected load. Incomplete or ineffective contact mating results in less contact surface area which reduces the contact ampacity and ability for that failing component to conduct current under load. Reduced contact ampacity results in increased or dangerous contact temperatures, higher contact impedance, unintentional arcing and a potential breakdown and failure of the components			
	Failure scenario(s)			During the last ‘closed’ operation of the fused disconnect, the ‘C’ phase moving contacts did not engage or mate as designed. The fused disconnect controls and protects equipment that processes and recycles plastics. The connected load is approximately 620 amperes and the process is in operation 24 hours per day on a five day on, two day off cycle. Essentially, the fused disconnect is near the maximum safe operating ampacity during process operation and as such, it is vital that all contacts mate effectively and all conductor terminations are torqued to specifications. The poor contact mating of ‘C’ phase (third phase) created a high impedance condition at the contact point, a dangerous over-temperature condition at the contact which resulted in a breakdown of insulating properties and fault to ground at the ‘C’ phase area. Of note is that the operating handle mechanism, closing/opening springs and			

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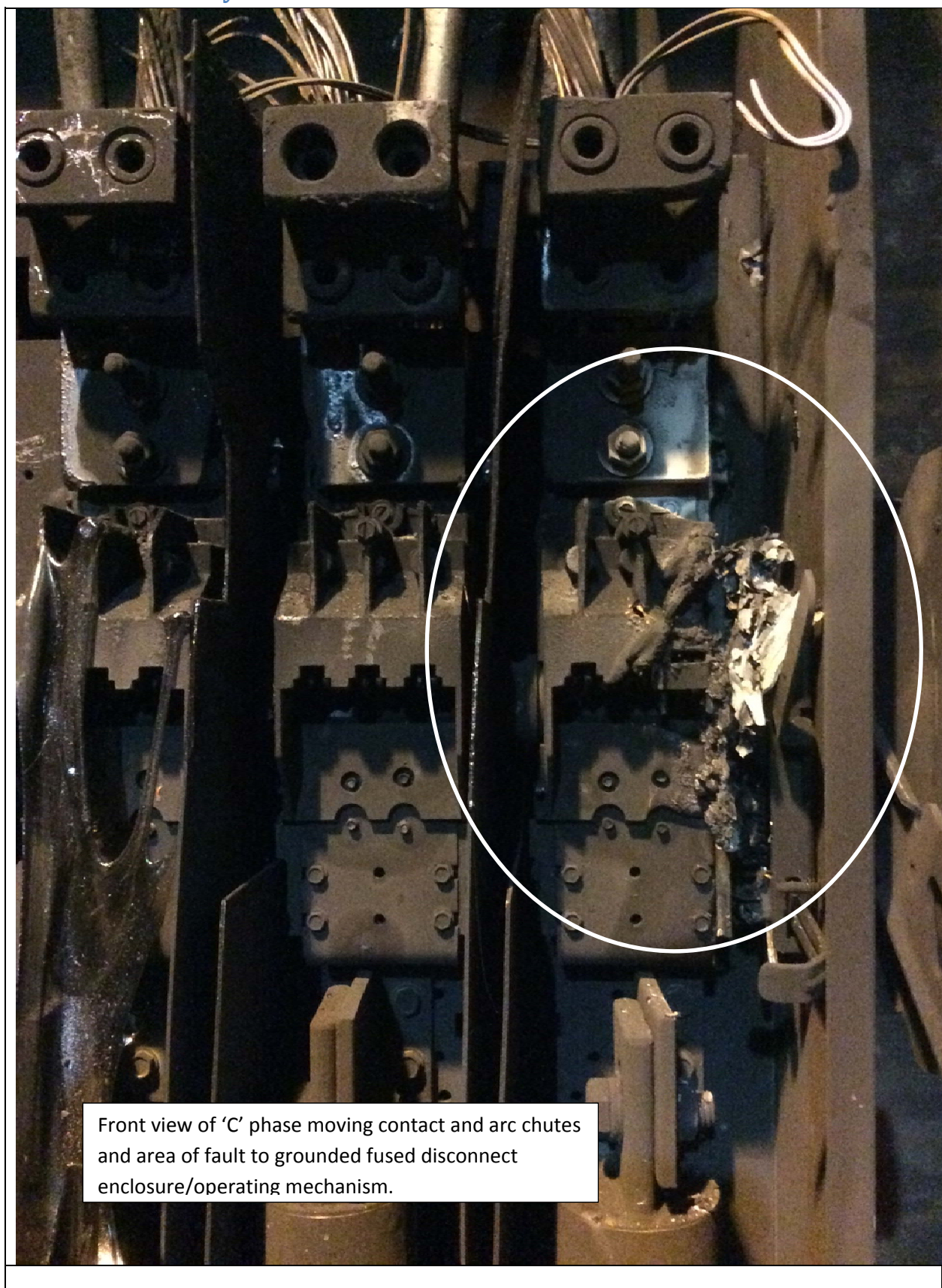
		enclosure door hardware are concentrated near the 'C' phase contact area providing several conductive paths for the ground fault once the breakdown occurred.
	Facts and evidence	The plastic recycling process had been in operation for approximately 36 hours since resuming operation after a weekend shutdown. Mid-morning one of the operations employees noted a distinct crackling sound emanating from the power distribution equipment area. He walked over and noted smoke and sparks in and around the fused disconnect. He immediately requested assistance from another employee and notified his supervisors who contacted local fire/rescue via 911. During the arcing and fire incident, the disconnect fuses opened under fault current conditions and upstream overcurrent circuit breaker protection operated as coordinated. The fire continued until fire/rescue personnel arrived and extinguished the fire.
	Causes and contributing factors	<p>Post fire investigation revealed that all conductor terminations in the switch were tight to specifications, all conductors are correctly sized, overcurrent protection fuses are correctly sized.</p> <p>Observations and discussion with staff and maintenance personnel did not identify any lack of attention or lack of maintenance: during the past twelve month period all equipment was thermal scanned for 'hot spots', equipment was surveyed and operated, conductor terminations were checked, nothing untoward was noted. Examination of adjacent equipment confirms a satisfactory level of maintenance; equipment is kept in good working order and in good condition.</p> <p>All indications point toward an internal equipment failure in and about the 'C' phase contact point of the fused disconnect resulting in an electrical fire incident.</p>

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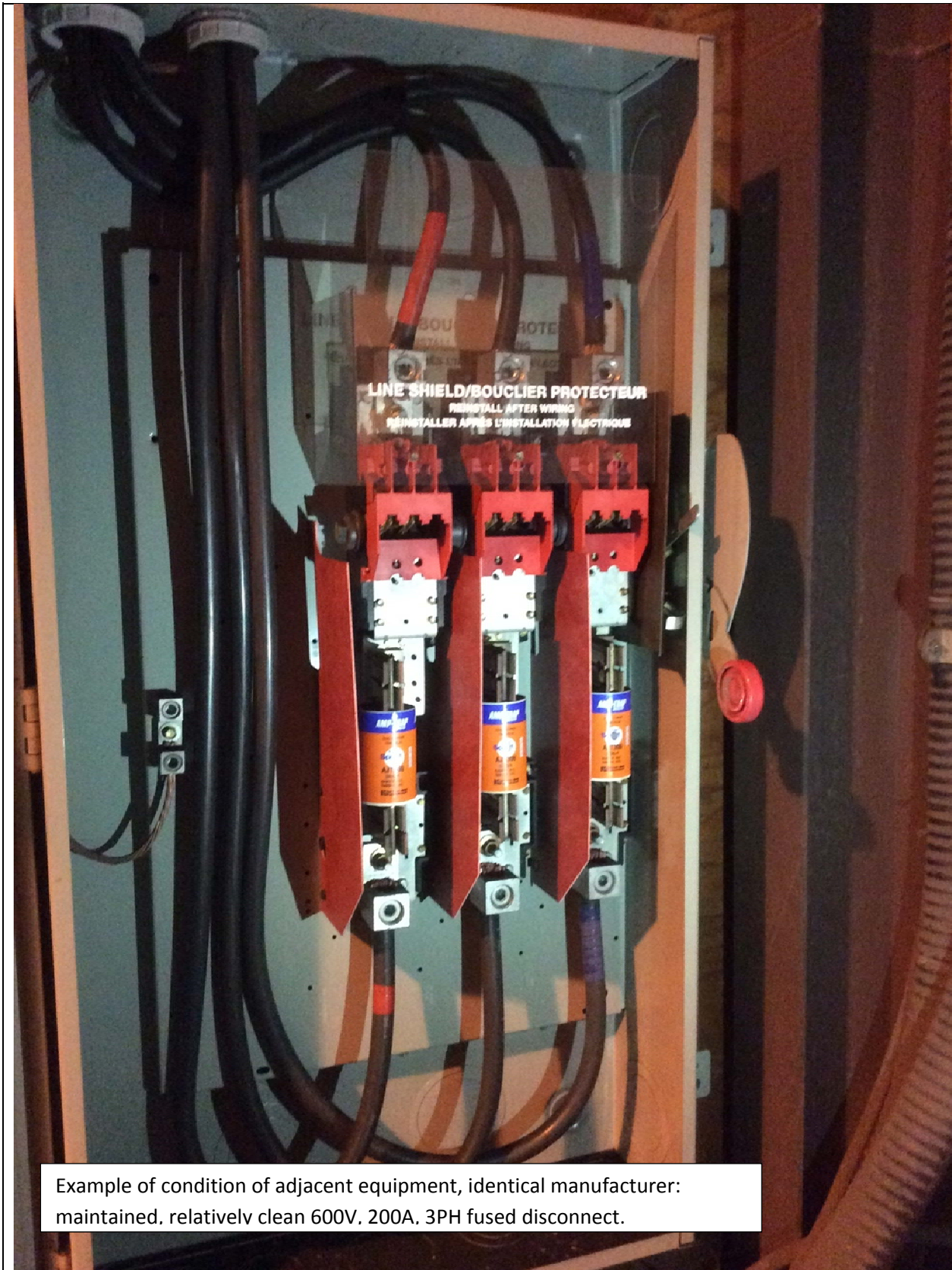
Area of incident: 600V, 800A, 3PH fused disconnect

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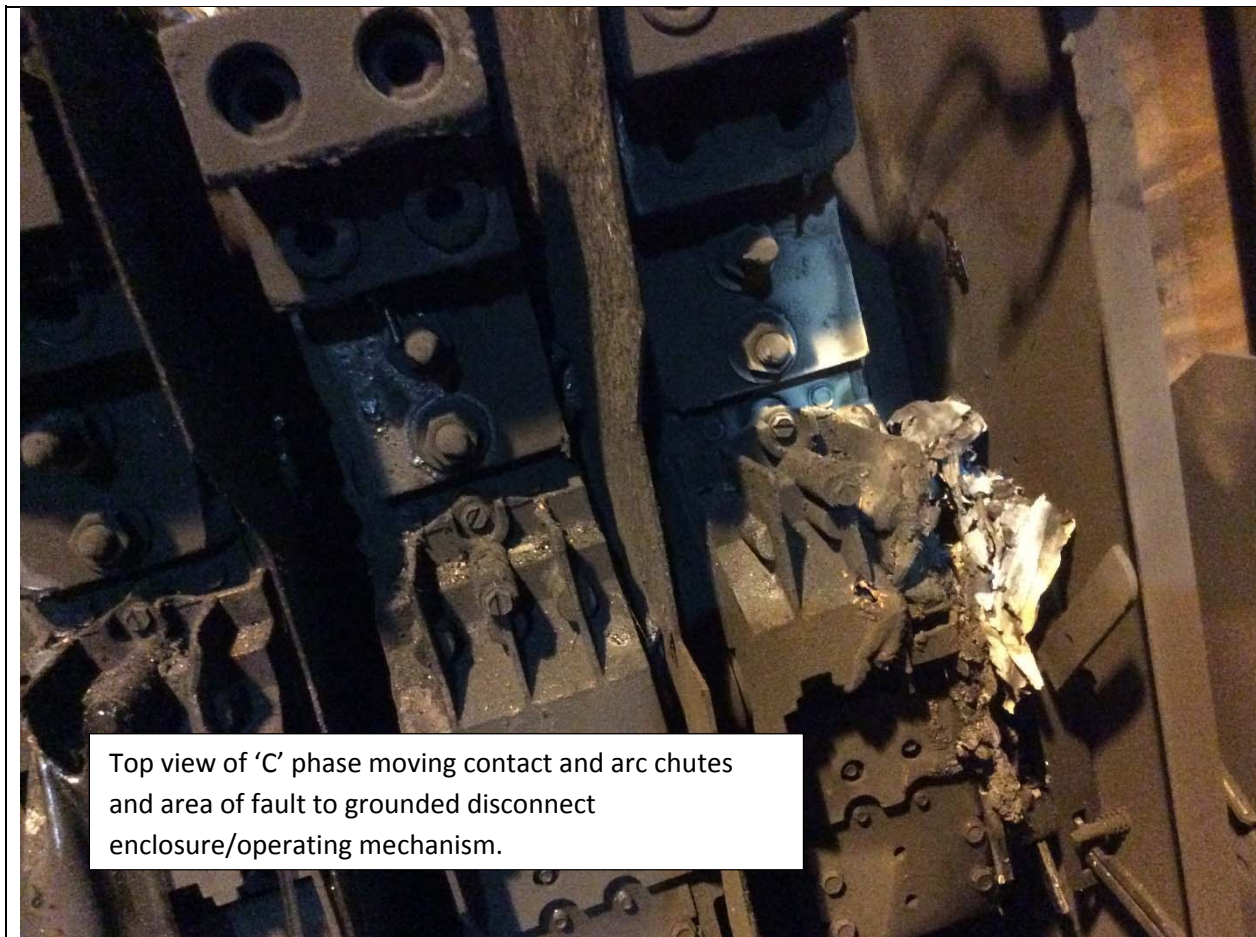
Front view of 'C' phase moving contact and arc chutes and area of fault to grounded fused disconnect enclosure/operating mechanism.

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Example of condition of adjacent equipment, identical manufacturer: maintained, relatively clean 600V, 200A, 3PH fused disconnect.

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Top view of 'C' phase moving contact and arc chutes and area of fault to grounded disconnect enclosure/operating mechanism.